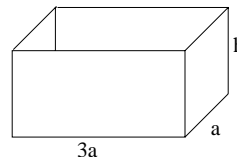


MATH 151 Help Session Problems

1. A box has a rectangular bottom, with one side three times as long as the other, and an open top. The total area of the material used to make the box is 144cm^2 . What is the largest possible volume the box can have? What are the dimensions of the box with the largest volume?



2. A ladder 15 m long rests against a vertical wall. If the bottom of the ladder slides away from the wall at a speed of 3 m/s, how fast is the angle between the top of the ladder and the wall changing when the angle is $\pi/6$ radians?
3. Prove $\frac{d}{dx} \arcsin x = \frac{1}{\sqrt{1-x^2}}$
4. Evaluate $\lim_{x \rightarrow 0} \left(\frac{1}{x^2} - \frac{1}{x \sin x} \right)$.
5. Differentiate $f(x) = \log_3 \sin(e^{-3x})$.
6. Find the tangent line for
- $f(x) = (x^2 + 1) \sin(2x)$ at $x = \frac{\pi}{2}$
 - $x = t^2$, $y = t^3 + 9t$ at $t = 1$.
7. If $\vec{r}(t) = \langle \arctan(2t), \ln(t+1) \rangle$
- Find a tangent vector at $t = \frac{1}{2}$.
 - Find a vector equation of the tangent line at $t = \frac{1}{2}$.
 - Find the angle between the position and tangent vector at $t = \frac{1}{2}$.
8. If $f(x) = e^{-x^2}$
- find where $f(x)$ is increasing and decreasing and identify local extrema.
 - find concavity and inflection points.
9. $\int \cos^4 \theta \sin \theta d\theta$
10. A ball is thrown upward with an initial velocity of 64 feet per second from an initial height of 80 feet. (Assume the gravitational force on the ball is 32 ft/s^2 .)
- Find the position function that gives the height s as a function of time t .
 - When does the ball hit the ground?